A NOVEL pH SENSOR

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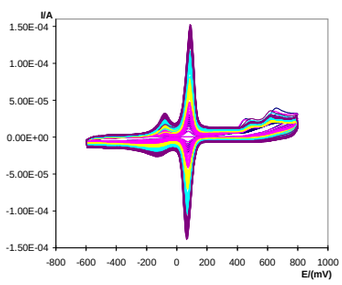
Adequate measurement of proton activity (pH) has become a fundamental parameter whether in basic sciences or for technology applications. Hence, a series of devices have been developed which are capable of responding analytically to changes in the proton concentration [**1-3**]. One promising way to fabricate pH sensors is to construct the so called chemically modified electrodes (CME), by means of incorporating substances that have a well known acid-base activity, to supports, generally, of a polymeric nature [**1-3**] The present work shows that 5-amino 1-10 phenanthroline (5-Aphen) is susceptible to polymerisation on a carbon paste electrode (CPE) and with the film as formed poly(5-Aphen) is possible to construct a pH sensor. This is a novel sensor based on the same principle as the previous ones, but in this case, the sensitive substance is simultaneously the immobilising phase.

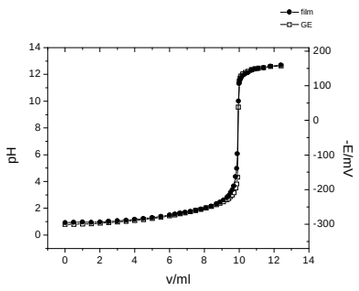
The polymer was obtained from the 5-Aphen monomer at 4 x 10^{-3} M at a pH = 0.3. Starting at a null current potential of –100 mV towards oxidation, two oxidation processes become apparent, when the direction of the scan is reversed a reduction takes place at +80 mV, with the peak having a characteristic shape corresponding to that of species adsorbed at the surface of the electrode. When the direction of the scan is reversed again an oxidation peak at +80 mV is obtained, which is maintained for a series of 40 cycles, with its charge increasing as a function of the number of cycles. The value for the growth polymer rate is 4x10^{-6} C/cycle number [**4**].



Cyclic voltamperometry for the poly(5-Aphen) formation in 2x10^{-3} M at CPE in sulphate medium 0.5 M at pH = 0.3, 100 mV/s scan rate with 200 cycles.

Considering that the polymer chains have functional groups derived from the amine and imine groups of the 5-Aphen, and that these functional groups have acid-base properties related to their capacity to get protons, it can be established that the pH is a factor that modifies the potentials of the redox processes of the film, therefore it can have an analytical response to pH changes.

In order to confirm the response of the film as a function of the pH applied in acid-base measurements. The measurement of 0.5 M sulphuric acid is carried out in the presence of NaOH 1 M, obtaining the pH data with a glass electrode and potential with the poly(5-Aphen) membrane at the same time.



Typical curve for the titration of 10 ml 0.5 M sulphuric acid with NaOH 1 M, obtained with two electrodes (a) glass electrode, and (b) pH sensor.

As it can be observed, the analytical response was obtained with both methods in the same volume, and the behaviour of both pH sensors is similar. Therefore, the membrane obtained can be used as an alternative to the glass electrode for analytic determinations.

References

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